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A PSYCHOMETRIC INSTRUMENT FOR THE EARLY IDENTIFICATION OF UNDERACHIEVERS

by

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A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "A Psychometric Instrument for the Early Identification of Underachievers" submitted by Rodney C. Conklin in partial fulfillment of the requirements for the degree of Master of Education.

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ABSTRACT

This study was designed to investigate the possibility that the concept of irrational beliefs as propounded by Albert E. Ellis could be utilized in the identification of academic underachievers.

An attitude-type scale constructed by Zingle, consisting of items which correspond to each of eleven irrational ideas considered prevelant in our modern society by Ellis, was revised by the present researcher. The resulting 25 item scale (I-I Inventory) was statistically validated using a large sample of high school students.

From this sample groups of under-, average, and over-achievers were isolated using as the criterion discrepancy between ability, as measured by a traditional group I.Q. test, and achievement, as measured by teacher marks.

Scores made on the I-I Inventory by under-, average, and overachievers were compared. The major experimental hypothesis tested was that these groups would score significantly different on the I-I Inventory. In particular, underachievers would score higher than average achievers who, in turn, would score higher than overachievers.

The results confirmed the hypothesis and the conclusion was drawn that academic underachievers possess irrational beliefs to a greater degree than do other students.

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CHAPTER I

THE THESIS PROBLEM AND ITS BACKGROUND

The problem of academic underachievement has received much attention from both educators and lay people. It has prompted considerable investigation by educational psychologists who have delineated many sub-problem areas within the main problem. Some of these are: (1) the definition of who is an underachiever and who is not, (2) the identification of the underachiever by means other than the combination of ability and achievement tests, and (3) the subsequent treatment of underachievers. This study will concern itself primarily with the definition of underachievement and with an improved method of identifying the underachiever.

Educators, besides being apprehensive about the underachieving student per se, are concerned because they believe that, standards of school performance are lowered by this ineffectual student who does very little work. Thus most Canadian school boards like their American counterparts feel obligated to take some sort of positive action with regard to these students (Warren, 1961). Several approaches have been used which have included tutoring, remedial reading, training in study skills, and counseling. In setting a policy, the West Jasper Place School Board, for example, first made it plain that "A high school student is entitled to education at public expense provided he puts forth a serious effort to profit from that education." (Policy

Handbook for West Jasper Place School District, 1960, Section IV-J). The statement then continues by saying that:

> In implementing the policy....Our concern is not so much with the pupils who try hard but are unable to succeed as with those who simply fail to put forth an effort. (Section IV-J).

In practice, the student who has a large discrepancy between his ability and achievement comes under the threat of expulsion through a warning letter from the school sent to his home. He is then given a period of time in which to bring his achievement more in line with his ability. If the student does this, then he is no longer considered an underachieving student according to the foregoing policy; if he does not, he may be expelled from school.

Other methods of attempting to reduce the gap between ability and achievement are presently being used. The oldest and most common method of helping the underachiever is tutoring him in the specific subject area in which he is failing. In some cases this procedure works; in others, it has proved ineffective (Baymur and Patterson, 1960). A more recent method of helping the underachiever is subjecting him to a program of training in methods of study, or referring him to a reading clinic or to an English teacher who teaches a special course in remedial reading and/or language skills. While some studies report that these remedial programs in study skills and reading provide some help to students in academic difficulty other studies suggest that such programs are of no value (Blake, 1956).

Studies and observations by Kirk (1952), Kimball (1952), and Shaw and Grubb (1958) indicate that underachievement is not a surface phenomenon that can be easily modified. Rather, it is related to the basic personality matrix of the individual which suggests the necessity for some kind of therapeutic experience if the individual is to improve in his achievement. Studies by Baymur and Patterson (1958) and Zingle (1965), for example, found that long term psychotherapeutic counseling can have a beneficial effect on course grades, but the findings of other studies (Patterson, 1962) are negative. Therefore no definitive statements about the effects on marks of psychotherapeutic counseling can be formulated.

In summary, many approaches are being used in an attempt to bring the student's scholastic achievement more in line with his ability. Evidence as to the effectiveness of these methods is unclear and often contradictory. For every study which reports the success of one method another study can usually be found which contradicts the findings of the first. Notwithstanding, it seems reasonable to assume that there are some effective approaches in dealing with the problem. It follows, then, that if the underachiever can be identified at an early stage (before there is failure in the subject or before he is faced with the threat of expulsion) appropriate corrective measures can be initiated by school counselors and administrators. In accord with the need for early identification

it is the purpose of this study to revise and cross-validate an instrument constructed and partially validated by Zingle (1965) which shows considerable promise of being able to identify underachievers.

CHAPTER II

REVIEW OF RELATED LITERATURE

The underachiever has been compared to the successful achiever on many different psychometric instruments. Mainly through correlational analyses, many characteristics have been delineated which differentiate the underachiever from other groups such as average achievers and overachievers. Further, in this vein, many researchers have attempted to construct attitude-type instruments which would indicate, or predict the extent of, underachievement. Some of the more notable attempts are described below.

I. Research Related to Personality

Many studies (Jensen 1958, Shaw and Brown 1957, Durr and Schmatz 1954, Owens and Johnson 1949, Krug 1959, Gough 1953, Morgan 1952, Altus 1948, and McQuary and Truax 1955) have shown that the underachiever differs in personality from the successful achiever. Jensen (1958), Owens and Johnson (1949), Altus (1948), and McQuary and Truax (1955) found that underachievers tended to have higher mean scores on all scales of the MMPI. Furthermore, within the non-achieving group itself the students of low ability scored higher than students of high ability on the F, Psychopathic Deviate, Psychaesthenia, Schizophrenia, and Hypomania scales. Owens and Johnson (1949) found, as did Jensen (1958), that the underachiever

group scored high on scales which define the neurotic-psychotic syndrome. Another finding by Jensen was that the underachiever seemed to be inclinded toward social-extroversion as defined by the types of item to which he responded. Altus (1948) found that the underachiever was different from the overachiever on only one trait - Hypomania. He corroborated the findings of Owens and Johnson (1949) that the underachiever is more inclined toward social-extroversion which seems to indicate that he is well adjusted in the area of inter-personal relationships. Krug (1959) in his work with the Edwards Personal Preference Schedule (EPPS) found that overachievers scored significantly higher on the Achievement, Order, and Endurance scales and significantly lower than underachievers on the Affiliation and Heterosexuality scales. In a similar study, Deiner (1960) was able to find a significant difference between under- and over-achievers on the Order scale on which the overachievers scored higher.

The findings of Durr and Schmatz (1964) clarify some of the personality characteristics which differentiate gifted children who are reading in line with their potential (achievers) from those who are not reading as well in relation to their potential (under-achievers). The difference in personal adjustment reached significance while the difference in social adjustment did not. On the Mental Health Analysis Test the difference in liabilities reached the .05 level of significance. This indicated to the authors that

the low achieving gifted children were more likely to show behavioral immaturity, emotional instability, feelings of inadequacy, and certain nervous symptoms when compared with the high achieving gifted. On the SRA Junior Inventory (1951) the differences were significant on "About Me and My School" and "Things in General." When compared with high achievers, low achievers had poorer attitudes towards school, less satisfaction with school work, and a feeling that their needs were less likely to be fulfilled in school. They were more prone to fears and worries and feelings of "general inadequacy." These findings tend to be corroborated by Frankel (1960) who found that on the Mooney Problem Check List underachievers did not check any more problems than did overachievers except in the area of school life in which the underachievers presented more problems than did the overachievers.

Shaw and Grubb (1958) undertook to determine whether the trait of hostility would characterize the bright underachievers at the high school level. Shaw and Grubb confirm the findings of a previous study by Shaw and Brown (1957) that hostility is a more pronounced characteristic of bright male underachievers than of bright male achievers. Shaw and Grubb conclude from their findings that the problem is one which the underachiever brings to school with him and which seems to be an integral part of the personality make-up of the individual. They forward the suggestion that extensive counseling is what the underachiever should receive (p. 265).

Powell and Jourard (1963) found that underachievers disclose

more about themselves to parents while achievers disclose more to peers. The findings were construed as evidence of lack of emancipation from parents on the part of the underachiever. Powell and Jourard make it appear that the underachiever is more dependent than the overachiever. To make such a conclusion on the basis of greater communication between parent and underachiever is unsafe. The implication these authors make might be correct; however, it may only support previous research which found that the underachiever tends more toward social-extroversion than does the overachiever.

Another variable which has received some attention of late is that of "conformity." Coleman (1960) found that overachievers are rated lower than underachievers on the Change scale of the Edwards Personal Preference Schedule. Ringness (1965) found no differences between successful and non-successful bright ninth grade boys in conformity, but non-successful students had greater motive to affiliate and less motive to achiever. Ringness concluded that non-successful students failed to accept school and parental norms for academic achievement. Duff and Siegel (1960) found that high ability female overachievers tended more to conform to social requirements, to participate more actively in religious activities and less actively in aesthetic activities than did high ability female underachievers. Frankel (1960) also found that overachievers are more willing than underachievers to conform, especially in school matters.

In the area of interests Frankel (1960) found that on the Kuder Vocational Preference Record the underachievers scored significantly higher on the Mechanical scale whereas the overachievers scored higher on the Scientific scale. In addition, the overachievers were more interested in the Computational and the underachievers in the Artistic as evidenced by their scores on these two scales. The findings of Deiner (1960) support those of Frankel, in that he, too, found that underachievers scored significantly higher on the Artistic scale of the Kuder Vocational Preference Record.

In summary, the studies reviewed seem to suggest that:

1. Underachievers are more maladjusted as indicated on certain clinical scales of existing personality inventories than are overachievers or average achievers.
2. Underachievers are less willing than successful achievers to conform to the rules set down by the parents and the school.
3. Underachievers respond to certain scales of personality tests in ways that indicate flexibility and tendency to "change."
4. Underachievers tend to score higher than successful achievers on the Artistic scale of certain interest tests.

5. Underachievers' responses to certain attitude tests indicate a tendency to want to affiliate, and also a tendency toward social-extroversion.

II. Research Related to Construction of Underachievement Scales

In attempting to identify the underachiever by means other than ability and achievement tests, several tests have been constructed utilizing the knowledge that underachievers differ from successful achievers on many personality traits. Altus (1948), McQuary and Truax (1955), Owens and Johnson (1949), and Gough (1953) have constructed scales which purport to discriminate between under-, average, and overachievers.

Altus (1948) began by administering the group MMPI to 50 students and then calculated means for his achiever and non-achiever groups. It was found that only one scale - Hypomania (Ma) - showed significantly different means for the two groups. All the differences, however, were in favor of greater maladjustment for the underachieving students. A further analysis was made to determine which of the 567 items discriminated between the groups. A tabulation was made of all "yes" answers to each of the items in the MMPI for the two groups and since the groups were relatively small (n = 25), a difference of 5 "yes" responses was great enough to justify the inclusion of the item in the scale. In this manner 60 items were isolated. Altus made certain conclusions concerning his two groups on the basis of their

responses to these items. He stated that one who works below his capacity is an immature, somewhat manic, social-extrovert, while his opposite number who works above his capacity is a rather aloof, well controlled introvert. A cross-validation was performed using the 60 item scale on 85 students and it was found that the correlation of the scale was .39 with psychology grades and .23 with honor point ratios. It is not reported which of the 85 students were underachievers and which were overachievers so that no indication of discriminating power was given. It is not made known, as a result, just how efficient the 60 item scale is in identifying underachievers. No reliability or stability measures are reported by Altus.

Owens and Johnson (1949) appear to have followed Altus' lead, but eventually accomplish less as far as a test is concerned. Using certain discrepancies between ability as measured by the American Council on Education Psychological Examination (ACE) scores and achievement as measured by grade point average (GPA) three groups were identified. These were underachievers, average achievers, and over-achievers. The author administered 300 items from the MMPI, the entire Minnesota Personality Scale, and 25 other items developed by the author. Criteria adopted for final item selection were that item responses must show a tetrachoric correlation of at least .20 with the underachievement criterion and secondly, that overachievers must differ in the same response direction from average achievers as average achievers from underachievers. This second criterion was a

precaution against the isolation of items which might be answered in common fashion by both under-, and overachievers and would therefore be diagnostic only of abnormal achievement, in general, rather than underachievement in particular. Twenty-six items whose tetrachoric r's with underachievement ranged from .20 to .82 were isolated. Rather than subject the items to closer statistical scrutiny in cross-validation, for example, they were regarded individually and certain conclusions about the differences between the groups were made by the author. Altus' findings were supported in that the typical under-achiever uniformly and without exception gave the more extroverted response than did the typical average or overachiever.

McQuary and Truax (1955) did essentially the same thing as Altus and Owens and Johnson. They selected a group of under- and overachievers using one half of a standard deviation difference between the normalized scores on ability and achievement. The measure of ability was the American Council on Education Psychological Examination (ACE) and the measure of achievement was the grade point average (GPA). The students in each of the two groups were then presented with the card form of the MMPI and an item analysis was performed on the resulting responses. It was reported that 21 items with critical ratios (C.R.) of 2.33 or greater were isolated. Three additional items which were also on the Altus scale were used. The resulting scale of 24 items was given to a new group and proved to be relatively inefficient in identifying only 9 of 21 predetermined

overachievers and 12 of 55 predetermined underachievers.

More recently Waters (1964) has used other non-intellective factors to construct a scale designed to yield both a score predicting the extent of under- or overachievement and a profile showing areas of relative strengths and weaknesses. She obtained her items from the responses of 200 male and female psychology students at the Ohio State University. Half of the students wrote essays entitled "Strengths and Advantages Which I Have That Will Help Me to Make Better Grades," while the other half wrote on the topic "Weaknesses and Disadvantages Which I Have That May Hurt My Grades." From these essays, statements of strengths and weaknesses were extracted and recorded with a minimum of editing. From these statements a check list inventory of 36 items was devised. The list was then presented to another group for validation purposes. The correlation between the over- and underachievement criterion and this inventory was .39 when using the best weighted multiple correlation. The correlation is very modest, however, when one considers that about 15% of the variance between the criterion and scores on the inventory is common.

Another scale designed to discriminate between high and low achievers was constructed by Rothman (1961). The scale consists of 16 significantly discriminating, diverse, attitudinal statements. Austrin (1965) attempted to cross-validate Rothman's scale. He found that the scale did discriminate between groups of high and low

achievers but his results also indicate a 25% false positive rate. The scale's efficiency for selecting out under- and overachievers is now known.

III. Irrational Beliefs and the I-I Inventory

Lafferty (1963) developed a test based on irrational beliefs and investigated the effects of these beliefs on achievement. He called his scale the FAB scale, and it was made up of 10 items, mostly of the true-false variety. His irrational beliefs were based upon Ellis' (1962) eleven illogical ideas. The hypothesis that Lafferty forwarded was that the higher the degree of irrational belief the greater the degree of avoidant behavior. He defined avoidant behavior as lower school achievement as measured by a standardized test of academic achievement. The hypothesis was tested during an initial exploration with 131 fifth grade boys and girls. Lafferty found that his hypothesis was confirmed, but since all of the items dealt with achievement it is not surprising that high achievers did significantly better. In addition no control was made for I.Q. and as a result he did not show differences between under- and overachieving groups, but only between low and high ability groups.

Zingle (1965) in an experiment performed to evaluate the effectiveness of individual psychotherapy with underachievers constructed 122 items which he combined into an instrument known as the I-I Inventory (see Appendix A). He established a rationale for the

instrument by showing the relationship between a person's irrational beliefs and the phenomenon of underachievement. Eleven major illogical and irrational beliefs which Ellis (1962) regards as presently ubiquitous in Western civilization are presented. It was the central theme of Zingle's work that these kinds of irrational beliefs presented by Ellis are basic to the underlying causes of underachievement. Therefore, it is concluded that an inventory which could evaluate the extent of these irrational beliefs would be useful. The first step in construction of the inventory was the assembling of a criterion-specific pool of inventory items. It is reported that the selection and writing of the items is based upon the irrational beliefs outlined by Ellis. Twelve to fifteen items were written with reference to each of the eleven major irrational beliefs. The intention was to produce eleven subtests with the possibility of gaining eleven sub-test scores and one total test score. Zingle does not report on the statistical methods or procedures used in writing and selecting the items.

Because the test Zingle developed shows some promise of identifying underachievers it was felt that through item analysis, against the criterion groups of under- and successful achievers, and cross validation with a new sample, the instrument could be upgraded in its efficiency not only to discriminate between the groups in question but also to be able to predict the probability of an individual's belonging to the underachieving group.

CHAPTER III

ANALYSIS AND REVISION OF THE I-I INVENTORY

I. Introduction

As part of the Zingle study the I-I Inventory was administered to a group of 751 male and female students in grades 10, 11, and 12 at Jasper Place Composite High School, Edmonton, Alberta. The students were divided into two groups according to the difference between their standardized scores for ability* and achievement.** The standard score used was the T score with a mean of 50 and a standard deviation of 10. If a student's T score for ability was 13 or more points higher than his corresponding T score for achievement he was defined as an underachiever. All other students were then "lumped" together and could be referred to as successful achievers in that they were not underachievers.

II. Item Analysis

The first step in the analysis of the instrument was to subject each item to an analysis. The intent, at this point, was to isolate those items which seemed to discriminate between underachievers and successful achievers. These, then, were the two criterion groups against which each item was analyzed. Because of the nature of the

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*Henmon-Nelson Test of Mental Ability (Form A).

**Aggregate of teacher marks on November report card.

instrument any item analysis would not do. No analysis which assumed a correct or incorrect response could be utilized. The fact that each item had 5 distinct response categories (yes through to no) presented some special problems of scaling. It was finally decided to use the Kolmogorov-Smirnov Two Sample Test (Siegel, 1956). This is a modified chi square test which tests whether two independent samples have been drawn from the same population. In this case the two population samples were the frequency distributions of the responses to each item by the two groups defined above. The test was used since it is sensitive to any kind of difference in the two distributions. These include differences in location (central tendency), in dispersion, or in skewness. This test is concerned with the agreement between two cumulative distributions. If the two samples have been drawn from the same population distribution then the cumulative distributions of both samples may be expected to be fairly close to each other, inasmuch as they both should show only random deviations from the population distribution. If the distributions are too far apart at any point this suggests that the samples come from different populations. Thus a large enough deviation between the two samples is evidence for rejecting the null hypothesis. Items were retained or discarded on the basis of two criteria. The first was that the chi square value obtained from applying the Kolmogorov-Smirnov test had to be 3.22 or greater. This particular value was chosen because its probability level was .20, a figure regarded by the author and other researchers

previously cited in this chapter as adequate for initial inclusion in a new test (Altus, 1948 and Owens and Johnson, 1949). The second criterion was that the mean score on each item for the underachieving group had to be equal to or greater than the mean score on the same item for the successful achieving group. As a result of the above procedure 25 items were selected to make up the new version of the instrument which has been called the I-I Inventory (revised). These 25 items together with their chi square values and responses in the direction of underachievement appear in Appendix B.

III. Reliability

The second step in the development of the new version of the I-I Inventory was to establish its reliability. A test-retest experiment with 91 students was performed by Zingle (1965) on his 122-item form of the scale and a reliability coefficient of .80 was obtained. Using the same retest data on the 25 items comprising the I-I Inventory (revised) a reliability coefficient of .73 was calculated. It is interesting to note that although the present version of the test was reduced in length to only 25 items, as compared to the original 122, the retest reliability was not appreciably reduced. A further measure of reliability was obtained by applying Ebel's (1964) internal consistency technique to the scale. This procedure yielded an internal consistency coefficient of .60.

IV. Validity

Construct Validity

In order to establish construct validity for the I-I Inventory (revised) the correlations between it and several other instruments were measured. These instruments were carefully chosen in order that they might help to define the hypothetical construct of irrational beliefs and in this way demonstrate validity of the instrument.

1. Instruments Used to Demonstrate Construct Validity

A battery of tests called the School and College Ability Test (SCAT) is administered yearly by the Alberta Department of Education to all grade IX students. The test yields among other data three scores - a verbal, a quantitative, and a full scale score. The results form a part of each student's record. These scores were used for each student participating in the study.

The Barrons Complexity Scale (Barron, 1963) was also used in the study. A copy of the scale can be seen in Appendix C and the keyed responses in the direction of complexity are reported in Appendix D. Personality correlates of the preference for complexity as measured by this scale have been reported and are summed up briefly here. The following relationships have been noted by Barron (1963):

(a) Preference for complexity is related positively to rapid personal tempo, verbal fluency, impulsiveness, and expansiveness.

(b) It is related negatively to rigidity, control of impulse by repression, social conformity, ethnocentrism, and political economic conservatism.

(c) It is related positively to independence of judgement, originality, and breadth of interest.

In addition to these personality correlates statistically significant differences in adjectives have been found to describe high complexity scorers as being clever, delightful, possessing wide interests, and being mentally quick. Low complexity scorers have been described as being conventional.

A Kuder-Richardson odd-even reliability of .54 and a test-retest reliability of .74 are reported by Barron. Techniques of construction of the scale and further normative data can be found in the article by Barron (1963).

Two other tests, which can be found in the Kit of Reference Tests for Cognitive Factors (French, Eckstrom, and Price; 1963) were used. They are the Object Naming and Associations IV tests. The Object Naming test (see Appendix F) is a test of semantic spontaneous flexibility and involves the ability to produce a diversity of verbally expressed ideas in a situation that is relatively unrestricted. In this test it pays to change set in as many ways as possible. In this respect it approaches the fluency factors in nature, but the emphasis on change in kind of

idea, rather than sheer quantity of ideas, justifies the name flexibility.

The Associations IV test (see Appendix E) requires the taker to produce a word that is associated with both the two given words but which has a different meaning in its relationship to each of them. It involves the ability to produce words from a restricted area of meaning and an awareness of some similarity in the meanings of words amid the differences. The more associations that the subject has that are tied to a word and the more he is willing or flexible enough to work at a crude level of analogy or similarity, the higher will be his score on this test. Some normative data for this and the Object Naming test are reported by Kelly, Hunka, and Conklin (1965).

2. Intercorrelations of Scores on Instruments Used to Demonstrate Construct Validity.

Intercorrelations between the preceding tests as well as the data obtained from the student's records (Academic Achievement, Henmon-Nelson I.Q., and SCAT scores) were measured. The results are reported in Table I.

If the I-I Inventory (revised) has construct validity it should be related to other instruments in ways consistent with the hypothetical construct of irrational beliefs. The following hypotheses concerning the construct of irrational beliefs were proposed and tested:

TABLE I

CORRELATION MATRIX OF I-I INVENTORY WITH OTHER CONSTRUCT VARIABLES

Variable	H-N I.Q.	SCAT-V.	SCAT-Q.	SCAT-T.	B.C.S.	A. IV	O.N.	Acad. Ach.	T-Score D.
1. I-I Inventory (revised)	.001	-.002	-.014	-.020	.357**	-.013	-.008	-.233**	.244*
2. Henmon-Nelson I.Q.	-	.730**	.591**	.791**	.205*	.408**	.275**	.558**	.457**
3. SCAT - Verbal		-	.478**	.890**	.184	.403**	.271**	.476**	.295**
4. SCAT - Quantitative			-	.802**	.115	.253*	.181	.542**	.073
5. SCAT - Total				-	.129	.388**	.265**	.576**	.232*
6. Barrons Complexity Scale					-	.124	.106	.021	.180
7. Associations IV						-	.214*	.232*	.191
8. Object Naming							-	.211*	.066
9. Academic Achievement								-	-.457**
10. T-Score Difference***									-

*p < .05 **p < .01

***T-score difference here refers to T-score (IQ) minus T-score (Achievement)

Hypothesis I. It is hypothesized that there is no significant relationship between the I-I Inventory (revised) and traditional aptitude tests as exemplified by the Henmon-Nelson I.Q. and the SCAT.

Results I. The correlations between the I-I Inventory (revised) and ability tests range from -.020 to .001. As these correlations are not statistically significant it may be concluded that the first hypothesis is confirmed.

The rationale underlying the I-I Inventory (revised) indicates that a person who holds to irrational beliefs is much like the non-conformist, complex, and impulsive person that Barron describes.

Hypothesis II. It is hypothesized that if one scores high on a test of irrational beliefs, then he will also score high on the Barrons Complexity Scale.

Results II. The correlation of .356, significant at the .01 level, lends confirmation to the hypothesis.

Hypothesis III. It is hypothesized that there is no significant relationship between the I-I Inventory (revised) and the Associations IV and Object Naming tests.

Results III. The results show correlation coefficients of -.013 and .008 which are not statistically significant and

the hypothesis is confirmed.

Hypothesis IV. It is hypothesized that there is a positive relationship between the degree to which irrational beliefs are held and the degree of underachievement.

Results IV. The correlation of .244, significant at the .05 level, confirms the hypothesis.

One would expect that a person who held to a large degree of irrational beliefs would not achieve to the same extent as one who had fewer irrational beliefs.

Hypothesis V. It is hypothesized that there is a negative relationship between irrational beliefs and academic achievement.

Results V. The correlation coefficient of -.233 (significant at the .05 level) confirms the preceding hypothesis. The fact that the I-I Inventory (revised) correlates -.233 with achievement and .001 with ability (Henmon-Nelson I.Q.) indicates that the I-I Inventory (revised) seems to identify some non-intellective factors of achievement. The difference in the two correlation coefficients is significant at the .001 level.

Content Validity

As Zingle (1965) has reported, the items which constituted the I-I Inventory were carefully chosen in relation to Ellis' eleven major illogical ideas. An attempt was made to match the item as closely as possible (in wording and intent) to each of the illogical ideas. In

this manner some measure of content validity was ensured. Further evidence of content validity was gained by having three independent judges sort each of the 25 items according to the irrational belief which they felt the items were related to. The phi coefficient which is a special case of the Pearson product-moment correlation coefficient was used to calculate the degree of agreement among judges* The coefficients ranged from .53 to .90. Thus it may be concluded that the I-I Inventory (revised) has acceptable (APA Technical Recommendations, 1954) content validity.

V. Conclusions About Technical Qualities of the I-I Inventory (Revised)

An item analysis was performed on Zingle's (1965) 122 items using the Kolmogorov-Smirnov Test. Items which met the criteria of having a value of 3.22 or greater and whose means were higher for underachievers were retained. In this way a 25 item scale was developed and was called the I-I Inventory (revised). The scale was demonstrated to have a test-retest reliability of .73 and an internal consistency coefficient of .60. Content validity was gained both by careful selection of items and by inter-judge reliability. Agreement between judges was indicated by correlation coefficients of .53, .65, and .90. The scale was demonstrated to have construct validity by showing the relationship of the I-I Inventory (revised) to other known constructs.

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*Fellow graduate students.

VI. Hypotheses To Be Tested

The I.Q. and sex covariables are taken into account in each of the following hypotheses:

Hypothesis I

The main hypothesis to be tested in this study is that a test constructed on the basis of Ellis' irrational ideas will discriminate between under-, average, and overachievers as follows:

Hypothesis I (a) - Underachievers will score higher on the I-I Inventory (revised) than average achievers.

Hypothesis I (b) - Underachievers will score higher on the I-I Inventory (revised) than overachievers.

Hypothesis I (c) - Average achievers will score higher on the I-I Inventory (revised) than overachievers.

CHAPTER IV

EXPERIMENTAL DESIGN

I. The Sample

The subjects for this study were selected from the Jasper Place Composite High School, Edmonton, Alberta, which had an enrolment of approximately 1100. The subjects involved in this study were 726 students registered in grades ten and eleven. A breakdown of the sample by grade and sex is given in Table II.

TABLE II

A BREAKDOWN OF THE SAMPLE BY SEX AND GRADE

	Male	Female	Total
Grade 10	223	193	416
Grade 11	160	150	310
Total	383	343	726

Selection of Underachievers

Many different approaches for identifying underachievers are illustrated by the research studies reviewed in Chapter II. Thorndike (1963) argues that only one of the commonly used techniques is psychometrically sound. In this study two variations of the Thorndike approach were used and these are described below.

(1) Method A

The Henmon-Nelson Test of Mental Ability (Form A) was administered to all students at the beginning of the school year. Since the distribution of scores was negatively skewed in each of the two grades, the scores were normalized and standard score* equivalents calculated.

Grades received by each student on the Easter report card were summed for each student over eight** subject areas and the distribution of the aggregate scores for each grade were normalized and standard score equivalents calculated. An underachieving student was defined as one whose T score for aggregate achievement was 10*** or more points below the T score derived from his Henmon-Nelson I.Q. score. In this manner 113 students were classified as underachievers. The table of raw scores and corresponding T scores for both achievement and ability used to identify underachievers in this study is included in Appendix G.

(2) Method B

In a school as large as Jasper Place Composite High School many programs of study are offered to the students. To a great extent

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*These standard scores were conventional, normalized T scores with a mean of 50 and a standard deviation of 10.

**In cases where the student took fewer subjects the total aggregate was appropriately pro-rated.

***Ten is an arbitrary number which yielded an appropriate number of underachievers for the study.

one's interests and previous academic standing determine what program of studies he registers in. By calculating T scores across an entire grade and thereby grouping students from all programs of study together certain students such as those in the matriculation pattern might be penalized. It might be that some students are enrolled in academically more demanding courses of study and to compare them in relative achievement to students in other programs could be considered unfair. So the author grouped together those students who were in programs of study that required similar prerequisites as entrance requirements. These groups can be seen in Table III. Students in group one are required to have 4 A's and no mark below B in their major subjects* on the grade IX Alberta Department of Education Examinations. Group two students are required to have no mark below B in these subjects. Students in group three, as a general rule, require B's in Mathematics and Language or B's in Mathematics and Science depending upon the detail of the program. Students in group four need only a "pass" in grade IX as a prerequisite.

As a result of the above grouping, students more alike in ability were compared. The procedures described on page 28 were then used with each of the four groups to select the underachievers. In this manner 130 students were classified as underachievers. The

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*The marks referred to are those in Reading, Language, Literature, Social Studies, Mathematics, and Science.

TABLE III

GROUPINGS OF PROGRAMS ACCORDING
TO ENTRANCE REQUIREMENTS

	Program		Pattern	N	N
Group 1	Matriculation	-	Fine Arts		
		-	Foreign Languages	210	210
Group 2	General			13	
	Matriculation	-	Business Education	69	
		-	Technical	75	
		-	Home Economics	14	171
Group 3	Business Education	-	Secretarial	35	
		-	Bookkeeping	38	
		-	Stenographic	24	
	Technical Trades	-	Technical	31	
		-	Technical Apprentice	11	139
Group 4	Business Education	-	Clerical	71	
	Technical Trades	-	Apprentice	76	
		-	General Art	10	
	Home Economics			19	
	Vocational Service			30	216
TOTAL				726	726

table of raw scores and corresponding T scores for ability and achievement for each of the four groups can be seen in Appendix H.

A Comparison of The Two Methods of Identifying Underachievers.

Method A selected 113 students as underachievers. Method B selected 130. The similarity in the two methods is exemplified by the fact that the two methods selected 100 students in common. However, the two methods are also different because Method A selected 13 students not selected by Method B and Method B selected 30 students who were not selected by Method A. In each case the new students selected as being underachievers were by the alternative method "almost" selected. That is, the difference in the T scores for ability and achievement was very close to 10. The means of the differences for the missed persons in the two groups are 8.50 and 8.53 respectively.

Method Used In This Study

Because each of the methods identifies some subjects which the other does not it is obvious that the two methods are not interchangeable. The question is, then, what students should be labelled as underachievers and used in the experiment. Neither method seems superior so a case can not be made for the use of one instead of the other. Therefore it was decided to use those students who were identified as underachievers by both methods A and B. As was stated previously 100 students were so identified.

Two other groups were also identified. Students whose T scores for ability differed from their achievement T scores by 2 or less points were classified as average achievers. Students whose T scores for ability were 10 points less than their corresponding achievement T scores were classified as overachievers. Again, only those students identified by both Method A and B were used. In this manner 103 students were selected as average achievers and 115 students were selected as overachievers. A breakdown of the sample used in testing the hypothesis of the study is given in Table IV.

TABLE IV

UNDER-, AVERAGE, AND OVERACHIEVERS BY SEX AND GRADE

	Grade 10		Grade 11		
	Male	Female	Male	Female	Total
Underachievers	36	15	32	17	100
Average Achievers	34	31	20	18	103
Overachievers	37	28	21	29	115
Total	107	74	73	64	318

Table V presents the results of comparing the sub-sample with the full sample on the variables I.Q. and achievement. It can be seen that the two samples are not significantly different either in mean score or dispersion.

TABLE V

A COMPARISON OF THE FULL SAMPLE AND SUB-SAMPLE ON THE I.Q. AND ACHIEVEMENT VARIABLES

	Full Sample N = 726		Sub-Sample N = 318				
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	t	F	Sig. Level
Henmon-Nelson I.Q.	109.87	12.86	108.97	13.91	1.05	1.16	N.S.* N.S.
Academic Achievement	471.39	80.26	464.54	74.88	1.37	1.14	N.S. N.S.

*N.S. is used in all instances throughout the study where the differences did not reach the .05 level of significance.

II. Procedure

Administration of I-I Inventory and Other Tests

The I-I Inventory, Barrons Complexity Scale, Associations IV, and Object Naming tests were administered to the students on the morning of a school day in June, 1965. Provisions were made for all grade 10 and 11 students to remain in their homerooms and the tests were then administered to the students by the homeroom teachers. Teachers had been instructed the previous day by the author concerning details of administration. Total testing time was approximately two hours.

Scoring of the I-I Inventory (revised)

Scoring of all tests was done by the author. In the case of

the I-I Inventory (revised) the responses are marked on a five point Likert-type scale in which the five points represent: strongly agree, agree, undecided, disagree, and strongly disagree. These answers are weighted 5, 4, 3, 2, and 1 respectively with 5 representing the greatest degree of irrationality. Sixteen of the statements are worded in such a way that agreement signifies irrationality and the other nine are worded so that disagreement signifies irrationality. By summing the weights, a total test score can be derived for each individual. The Barrons Complexity Scale, Associations IV, and Object Naming tests were scored by the author according to the directions outlined in their respective test manuals.

III. Statistical Analysis

In order to test adequately the hypothesis of this study a method of analysis which permits comparison of the three groups in question on the criterion variable (I-I Inventory) score and control for both the I.Q. and sex variables is desirable. In most of the studies referred to in Chapter II it was found that when three groups such as under-, average and overachievers were identified, the mean I.Q.'s for each of the groups was quite different. In these studies the mean I.Q. of the underachiever group is relatively high as compared to the overachiever group. Thus the I.Q. and sex variables are controlled for in the present study. There is no reason to believe that there should be a difference between sexes on I-I Inventory scores

but a control will be placed on sex so that in the event that a difference does exist it will not contaminate the results. In order to insure that the above two variables of I.Q. and sex would not affect the results a regression analysis was chosen to test the hypothesis.

Multiple Linear Regression Analysis

The Multiple Linear Regression method, adapted by Bottenberg and Ward (1963), was the technique chosen for analysis of the data to test the hypothesis of this study. The technique seeks to clarify whether a critical variable, when added to a linear expression reduces the criterion error sums of squares.

The general approach is to express a vector of criterion variable data as a linear combination of a set of predictor vectors:

$$Y = a_1x^{(1)} + a_2x^{(2)} + a_3x^{(3)} + \ldots + e$$

where Y = vector of criterion variable data and

$x^{(1)}$, $x^{(2)}$, $x^{(3)}$ = vectors of predictor variable data

a_1 , a_2, a_3 = unknown weights associated with the predictor vectors

e = error or residual vector.

The problem is to find a set of weights which minimizes the sums of squares of the elements of vector e. Weights selected in this way are known as "least square weights."

We wish to minimize:

$$\sum_{i=1}^{N} (e_i)^2 = (e_1)^2 + (e_2)^2 + (e_3)^2 + \ldots + (e_n)^2$$

In order to test the hypothesis of this study, models such as those illustrated below were used.

Full Model

$$Y = a_0 u + a_1 x^{(1)} + a_2 x^{(2)} + a_3 x^{(3)} + a_4 x^{(4)} + e_F$$

Restricted Model

$$Y = a_0 u + a_1 x^{(1)} + a_2 x^{(2)} + e_R$$

where Y = criterion vectors

u = unit vectors

$x^{(1)}$, $x^{(2)}$, $x^{(3)}$, and $x^{(4)}$ are the predictor vectors

a_0, a_1, a_2, a_3, and a_4 are the least square weights associated with the predictor vectors

e = error or residual vector

The restriction, (omission of vectors $x^{(3)}$ and $x^{(4)}$ from the restricted model)*, serves as a basis for calculation of whether the data in vectors $x^{(3)}$ and $x^{(4)}$ have the effect of significantly changing the value of the criterion Y in the presence of vectors $x^{(1)}$ and $x^{(2)}$.

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*The number of vectors involved in placing a restriction on a model differ from hypothesis to hypothesis depending on what is being tested.

The hypotheses are:

$\sum(e_F)^2 = \sum(e_R)^2$ which means that the error sums of squares obtained by using the full model is equal to the sums of squares obtained from the restricted model.

The test of the hypotheses involves computation of an F-Ratio*.

$$F = \frac{q_2 - q_1 / (m_1 - m_1)}{q_1 / (N - m_1)} = \frac{R_F^2 - R_R^2 / (m_1 - m_2)}{1 - R_F^2 / (N - m_1 - 1)}$$

where q_1 = minimized error sum of squares obtained from an attempt to express the observed values in vector Y as a linear combination of an unrestricted set of predictors $\left[(e_F)^2\right]$

q_2 = minimized error sum of squares obtained from an attempt to express observed values in vector Y as a linear combination of a restricted set of predictors that express an hypothesis $\left[(e_R)^2\right]$

m_1 = numbers of unknown weights in full model

m_2 = numbers of unknown weights in restricted model

R_F^2 = variance accounted for in full model

R_R^2 = variance accounted for in the restricted model

We are testing, whether or not, reduction in error sum of squares obtained from the full model is significantly greater than the sum of squares from the restricted model.

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*See Bottenberg and Ward, page 126 for full details.

CHAPTER V

FINDINGS AND CONCLUSIONS

I. Results

Hypothesis I

A test constructed on the basis of Ellis' irrational ideas (I-I Inventory (revised)) will discriminate between under-, average, and overachievers.

The regression equations for this hypothesis are:

Full Model

$$\tilde{Y} = 65.5u - .08x^{(1)} + 2.59\,x^{(2)} + .00x^{(3)} + 3.96\,x^{(4)} + .00x^{(5)} - 5.86x^{(6)}$$

Restricted Model

$$\tilde{Y} = 47.1u + .06x^{(1)} + 3.73x^{(2)} + .00x^{(3)}$$

where $\tilde{Y}$ = the criterion; total score on I-I Inventory (revised).

u = unit vector

$x^{(1)}$ = Henmon-Nelson I.Q. covariable

$x^{(2)}$ = categorical vector; 1 if male, 0 otherwise.

$x^{(3)}$ = categorical vector; 1 if female, 0 otherwise.

$x^{(4)}$ = categorical vector; 1 if underachiever, 0 otherwise.

$x^{(5)}$ = categorical vector; 1 if average achiever, 0 otherwise.

$x^{(6)}$ = categorical vector; 1 if overachiever; 0 otherwise.

The hypothesis to be tested is that $a_4 = a_5 = a_6$. That is, that the weights associated with group membership (under-, average, and overachiever) are equal to one another so that the knowledge of group membership would then make no significant difference in the accuracy of predicting scores on the I-I Inventory (revised).

For the hypothesis the following were noted:

$R_F^2 = .1268$ $R_R^2 = .0338$ df = 2/315 F = 16.77

$p < .00001$

The F value so obtained is highly significant ($p < .00001$) and as a result the hypothesis that knowledge of group membership does contribute significantly to the accuracy of predicting I-I Inventory (revised) scores is accepted. That is, a significant difference among the groups does exist on I-I Inventory (revised) scores.

Hypothesis I(a)

Underachievers will score higher on the I-I Inventory (revised) than average achievers.

The regression equations for this hypothesis are:

Full Model*

$$\tilde{Y} = 59.74u - .09x^{(1)} + 2.59x^{(2)} + .00x^{(3)} + 9.85x^{(4)} + 5.84x^{(5)}$$

---

*The criterion (Y) and predictor variables $x^{(1)}$, $x^{(2)}$, $x^{(3)}$, $x^{(4)}$, $x^{(5)}$ etc. are the same as those which are defined on page 38 and which were used for testing Hypothesis I.

Restricted Model

$$\tilde{Y} = 56.33u - .03x^{(1)} + .12x^{(2)} + .00x^{(3)} + .25x^{(4)}$$

The hypothesis to be tested is that $a_4 = a_5$.

For the hypothesis the following were noted:

$R_F^2 = .1268$ $R_R^2 = .0839$ df = 1/313 F = 15.37

$p < .0001$

The F value so obtained is highly significant which indicates that underachievers score significantly different than average achievers on the I-I Inventory (revised). The weights associated with these two predictor variables (9.85 for underachievement and 5.84 for average achievement) prove that underachievers score significantly higher on the I-I Inventory than do average achievers.

Hypothesis I(b)

Underachievers will score higher on the I-I Inventory (revised) than will overachievers.

The regression equations for this hypothesis are:

Full Model

$$\tilde{Y} = 65.54u - .09x^{(1)} + 2.59x^{(2)} + .00x^{(3)} + 3.97x^{(4)} - 5.87x^{(6)}$$

Restricted Model

$$\tilde{Y} = 56.33u - .03x^{(1)} + 2.81x^{(2)} + .00x^{(3)} + 6.22x^{(4)}$$

The hypothesis to be tested is that $a_4 = a_6$.

For the hypothesis the following were noted:

$R_F^2 = .1268$ $R_R^2 = .0839$ df = 1/313 F = 15.37

$p < .0001$

The F value so obtained is highly significant which indicates that underachievers and overachievers differ on scores on the I-I Inventory (revised). Again, by inspecting the weights associated with each of these predictor variables (3.97 for underachievers and -5.87 for overachievers) it can be seen that underachievers score significantly higher than overachievers on the I-I Inventory (revised).

Hypothesis I(c)

Average achievers will score higher on the I-I Inventory (revised) than overachievers.

The regression equations for this hypothesis are:

Full Model

$$\tilde{Y} = 69.5u - .08x^{(1)} + 2.58x^{(2)} + .00x^{(3)} - 3.95x^{(5)} - 9.84x^{(6)}$$

Restricted Model

$$\tilde{Y} = 46.62u + .06x^{(1)} + 3.81x^{(2)} + .00x^{(3)} + 1.34x^{(6)}$$

The hypothesis to be tested is that $a_5 = a_6$.

The following were noted for the hypothesis:

$R_F^2 = .1268$ $R_R^2 = .0369$ df = 1/313 F = 32.22

$p < .00001$

The F value so obtained is highly significant and indicates that average and overachievers differ significantly on I-I Inventory (revised) scores. The weights indicate further that average achievers score significantly higher than do the overachievers.

Figure 1 presents the relationship of I-I Inventory (revised) scores to I.Q. scores for under-, average, and overachievers. Figure 2 presents the relationship of I-I Inventory (revised) scores to I.Q. scores for males and females.

It is interesting to note that if the means for under-, average, and overachievers on the I-I Inventory (revised) were not adjusted to account for the I.Q. and sex variables the differences in scores on the I-I Inventory (revised) remain significant. It may be seen from Figures 1 and 2 that I.Q. and sex are not significant factors in regards to I-I Inventory (revised) scores. In the case of individual items the influence of I.Q. would be very small. As a result, the means for each item for each of the three groups are presented in Tables VII, VIII, and IX. Total scores are presented in Table VI. In both cases t-values are also given so that one might infer the discriminating power of the test. However, it must be realized that the meaning of this procedure is somewhat unclear because the effects of I.Q. and sex, although small, have not been partialled out.

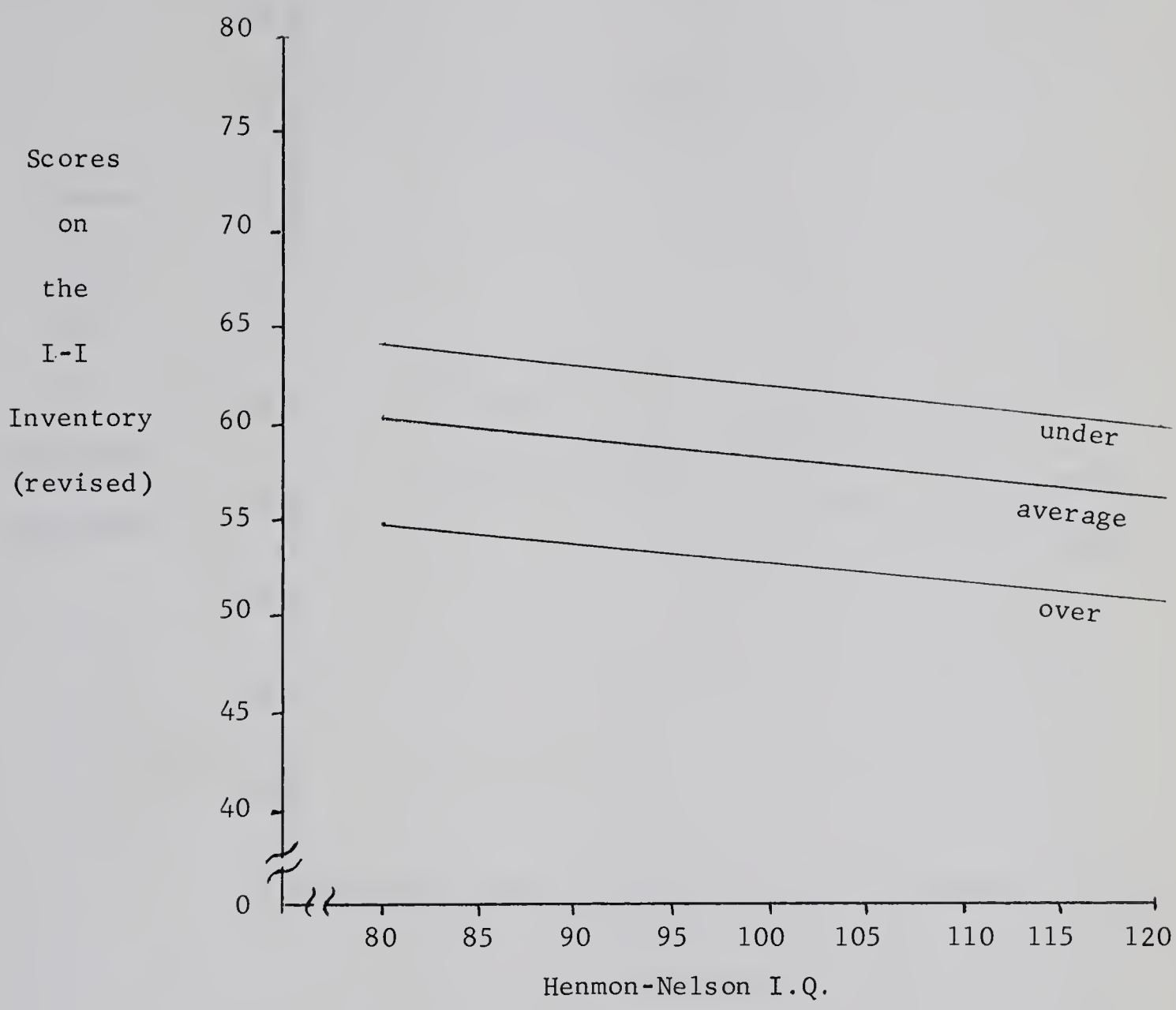

Figure 1

RELATIONSHIP OF I-I INVENTORY (REVISED) AND I.Q. SCORES FOR UNDER-, AVERAGE, AND OVERACHIEVERS

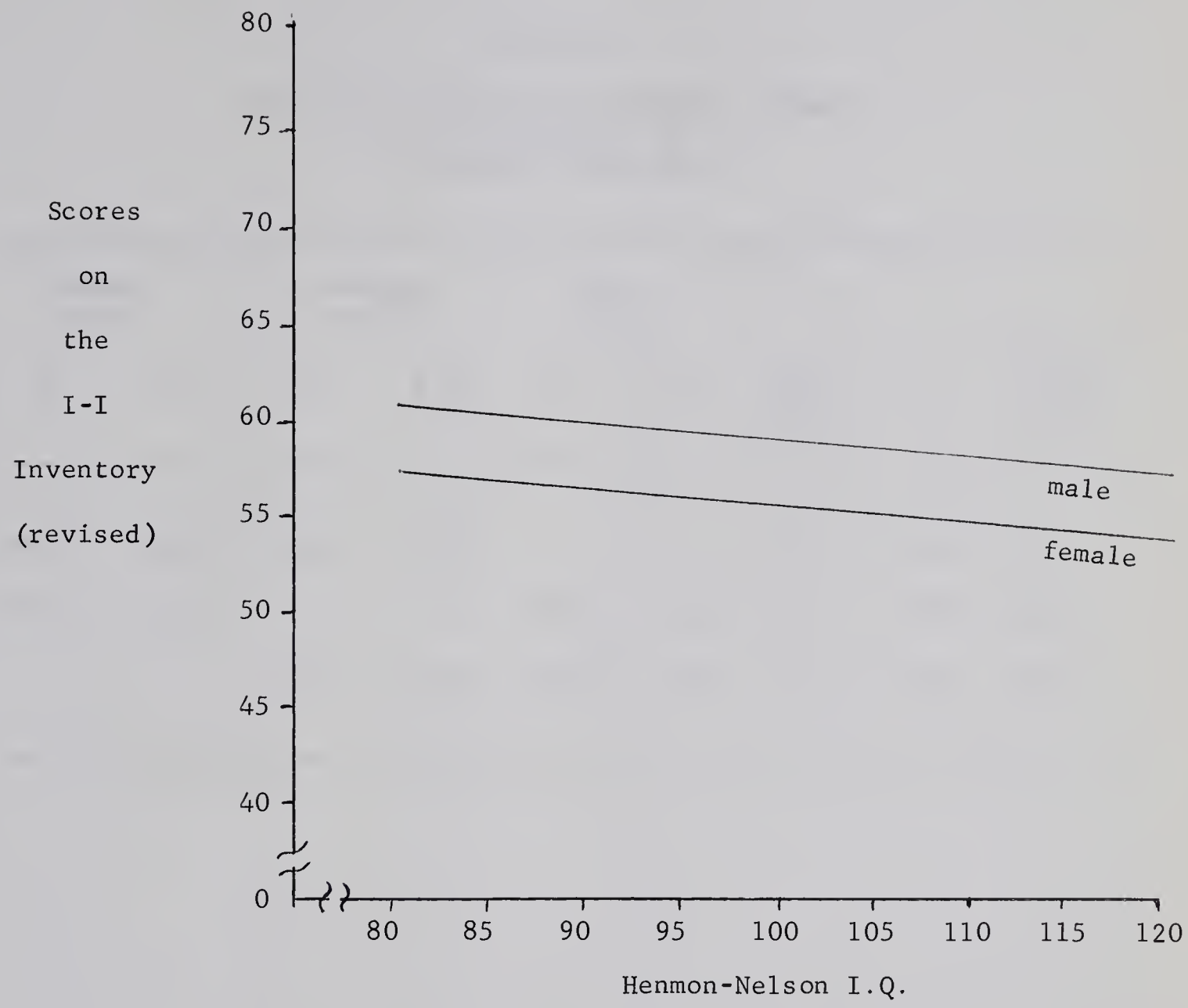

Figure 2

RELATIONSHIP BETWEEN I-I INVENTORY (REVISED) SCORES AND I.Q. FOR MALES AND FEMALES

TABLE VI

TOTAL SCORE OBTAINED BY UNDER-, AVERAGE, AND OVERACHIEVERS ON I-I INVENTORY (REVISED)

Under N=100		Average N=103		Over N=115				
$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	Mean Diff.	t	Significance Level
60.67	12.05	57.15	10.43			3.52	2.220	.05
60.67	12.05			52.00	9.36	8.67	5.901	.0005
		57.15	10.43	52.00	9.36	5.15	3.829	.0005

TABLE VII

MEANS, STANDARD DEVIATIONS, AND t-VALUES OF MEAN DIFFERENCES FOR UNDER AND AVERAGE ACHIEVERS ON I-I INVENTORY (REVISED) ITEMS

Item	$\bar{X}$ under	$\bar{X}$ average	S.D. under	S.D. average	Significance Level
1.	1.85	1.93	1.37	1.32	0.274 N.S.
2.	2.28	2.13	1.39	1.28	0.815 N.S.
3.	2.65	2.37	1.51	1.44	1.352 N.S.
4.	3.45	3.38	1.65	1.64	0.308 N.S.
5.	2.03	2.03	1.17	1.33	0.005 N.S.
6.	1.95	1.50	1.30	0.87	2.926 .01
7.	1.83	1.87	1.34	1.24	0.130 N.S.
8.	1.98	2.17	1.17	1.32	1.051 N.S.
9.	1.43	1.47	0.71	0.93	0.307 N.S.
10.	1.87	1.71	1.18	1.20	0.962 N.S.
11.	2.02	1.85	1.41	1.38	0.842 N.S.
12.	1.72	1.75	1.05	1.13	0.179 N.S.
13.	2.65	2.37	1.47	1.39	1.390 N.S.
14.	2.11	1.88	1.34	1.17	1.109 N.S.
15.	3.42	3.28	1.56	1.52	0.639 N.S.
16.	3.70	3.36	1.38	1.43	1.715 .05
17.	2.58	2.41	1.37	1.30	0.915 N.S.
18.	2.20	2.12	1.32	1.25	0.461 N.S.
19.	3.13	2.74	1.62	1.43	1.820 .05
20.	1.97	1.92	1.28	1.15	0.278 N.S.
21.	2.11	1.66	1.30	0.92	2.834 .01
22.	2.15	2.19	1.24	1.25	0.251 N.S.
23.	2.12	2.27	1.20	1.43	0.859 N.S.
24.	2.95	2.34	1.56	1.31	3.000 .01
25.	4.50	4.46	0.89	0.96	0.338 N.S.

TABLE VIII

MEANS, STANDARD DEVIATIONS, AND t-VALUES OF MEAN DIFFERENCES FOR UNDER AND OVERACHIEVERS ON I-I INVENTORY (REVISED) ITEMS

Item	$\bar{X}$ under	$\bar{X}$ over	S.D. under	S.D. over	Significance Level
1.	1.88	2.05	1.37	1.44	0.890 N.S.
2.	2.28	2.20	1.39	1.22	0.593 N.S.
3.	2.65	2.39	1.51	1.52	1.242 N.S.
4.	3.45	3.10	1.65	1.67	1.517 N.S.
5.	2.03	1.70	1.17	0.94	2.307 .05
6.	1.95	1.50	1.30	0.89	3.011 .01
7.	1.85	1.62	1.34	1.35	0.764 N.S.
8.	1.98	1.96	1.17	1.30	0.036 N.S.
9.	1.43	1.50	0.71	0.99	0.548 N.S.
10.	1.87	1.62	1.18	1.04	1.658 .05
11.	2.02	1.62	1.41	1.20	2.249 .05
12.	1.72	1.56	1.05	0.91	1.220 N.S.
13.	2.65	1.97	1.47	1.27	3.592 .0005
14.	2.88	1.57	1.34	0.99	3.218 .01
15.	3.42	2.85	1.56	1.45	2.758 .01
16.	3.70	2.86	1.38	1.51	4.200 .0005
17.	2.58	2.25	1.37	1.13	1.920 .05
18.	2.20	1.95	1.32	1.13	1.505 N.S.
19.	3.13	1.90	1.62	1.21	6.300 .0005
20.	1.97	1.70	1.28	1.06	1.710 .05
21.	2.11	1.75	1.30	1.16	2.149 .05
22.	2.15	1.97	1.24	1.19	1.055 N.S.
23.	2.12	2.32	1.20	1.16	1.244 N.S.
24.	2.95	1.89	1.56	1.19	5.629 .0005
25.	4.50	3.85	0.89	1.30	4.181 .0005

TABLE IX

MEANS, STANDARD DEVIATIONS, AND t-VALUES OF MEAN DIFFERENCES FOR AVERAGE AND OVERACHIEVERS ON I-I INVENTORY (REVISED) ITEMS

Items	$\bar{X}$ average	$\bar{X}$ over	S.D. average	S.D. over	Significance Level
1.	1.93	2.05	1.32	1.44	0.638 N.S.
2.	2.13	2.17	1.28	1.22	0.280 N.S.
3.	2.37	2.39	1.44	1.52	0.110 N.S.
4.	3.38	3.10	1.64	1.67	1.216 N.S.
5.	2.03	1.70	1.33	0.94	2.147 .05
6.	1.50	1.50	1.00	0.89	0.004 N.S.
7.	1.87	1.99	1.24	1.35	0.663 N.S.
8.	2.17	1.97	1.32	1.30	1.072 N.S.
9.	1.47	1.50	0.93	0.99	0.226 N.S.
10.	1.71	1.62	1.20	1.04	0.600 N.S.
11.	1.85	1.62	1.38	1.20	1.353 N.S.
12.	1.75	1.56	1.13	0.91	1.377 N.S.
13.	2.37	1.97	1.39	1.27	2.176 .05
14.	1.88	1.57	1.17	0.99	2.168 .05
15.	3.28	2.84	1.52	1.45	2.129 .05
16.	3.36	2.86	1.43	1.51	2.476 .01
17.	2.41	2.25	1.30	1.13	0.941 N.S.
18.	2.12	1.95	1.25	1.13	1.004 N.S.
19.	2.74	1.90	1.43	1.21	4.645 .0005
20.	1.92	1.70	1.15	1.06	1.501 N.S.
21.	1.66	1.75	0.92	1.16	0.612 N.S.
22.	2.19	1.97	1.25	1.19	1.328 N.S.
23.	2.27	2.32	1.30	1.16	0.298 N.S.
24.	2.34	1.89	1.31	1.19	2.666 .01
25.	4.46	3.85	0.94	1.30	3.870 .0005

II. Conclusions

Conclusions which may be drawn from the results are as follows:

1. A test constructed on the basis of Ellis' irrational ideas (I-I Inventory (revised)) discriminates between underachievers and average or overachievers in grades 10 and 11.

2. Underachievers, in grades 10 and 11, adhere to irrational beliefs as measured by the I-I Inventory (revised) to a greater degree than average or overachievers.

3. Average achievers, in turn, adhere to irrational beliefs to a greater degree than do overachievers.

CHAPTER VI

DISCUSSION AND IMPLICATIONS

I. Underachievement and Irrational Ideas

One conclusion can be drawn from the results of this experiment. Underachievers possess irrational ideas to a greater extent or degree than do average or overachievers. Furthermore, the relationship between the degree of irrational beliefs and underachievement is a linear one. This phenomenon is illustrated in Figure 3.

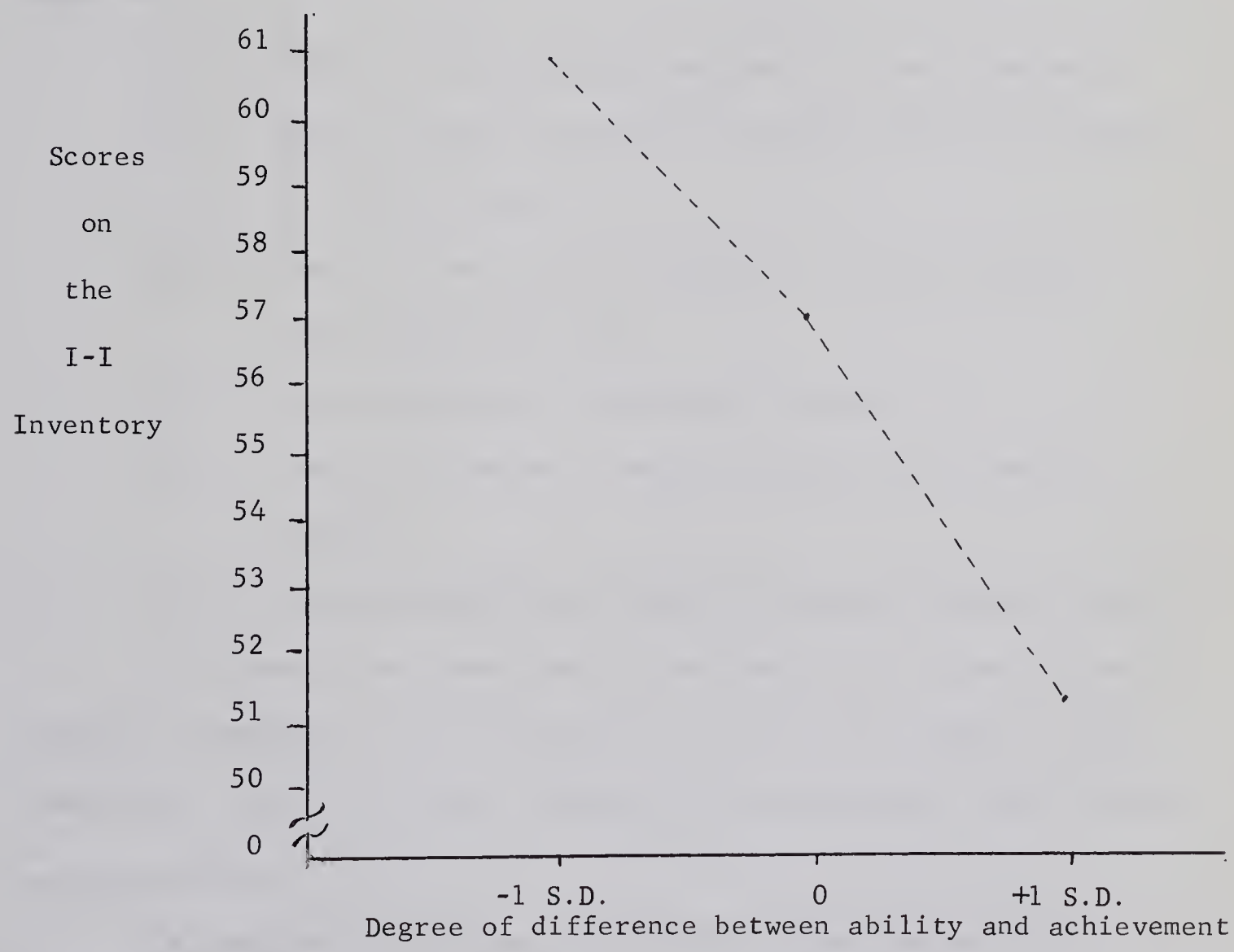

FIGURE 3

RELATIONSHIP BETWEEN IRRATIONAL BELIEFS AND ACHIEVEMENT

Since underachievers score higher on the I-I Inventory (revised) than do average or overachievers, it seems worthwhile to inspect the individual items to discover just what specific irrational ideas are prominent in the belief systems of underachievers. When the item analysis was performed on the original I-I Inventory many items had to be discarded. After the revision was completed it was found that of the 11 irrational ideas* represented in the original 122 items only 6 were represented in the items retained. These 6 ideas are:

(1) that it is exceedingly important for one to achieve.

(2) that if certain people are bad they should be punished for their villainy.

(3) that it is awful when things don't go the way one would like them to do.

(4) that unhappiness is externally caused.

(5) that it is easier to avoid responsibility than to face it.

(6) that one should have someone stronger on whom to rely.

In a sense these ideas seem to be like those of one who has a fatalistic approach to life and that it is not in his power to alter conditions. Of the six ideas related to underachievement two of them

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*A complete list of the 11 irrational ideas can be seen in Appendix I.

seem to be more prominent than the others. Of the 25 items in the scale, 12 are associated with ideas (4) and (5).

II. Sex and Irrational Ideas

In this study the ratio of underachieving boys to underachieving girls was approximately two to one. This finding is consistent with Zingle (1965) and other researchers (Thorndike, 1963). Because sex is a correlate of underachievement and I-I scores are correlated with underachievement it is of interest to observe any relationship between sex and I-I Inventory scores. An inspection of Table X leads one to the very definitive finding that boys score significantly higher on the I-I Inventory than girls. The difference between means is 3.54 points and is significant beyond the .001 level. Sex differences on the I-I Inventory were calculated for the smaller samples of under-, average, and overachievers and were found to be not significant.

It may be recalled that when testing the major hypothesis of this study sex was treated as a covariate. The finding with regard to sex differences stated above and demonstrated in Figure 2 signifies the importance of this procedure since a portion of the variance between under-, average, and overachievers on I-I Inventory (revised) scores was directly due to the sex variable.

TABLE X

MEANS, STANDARD DEVIATIONS, AND t-VALUES FOR MALES AND FEMALES ON NINE VARIABLES

Variable	Males N=383		Females N=343			Significance Level
	$\bar{X}_M$	S.D.$_M$	$\bar{X}_F$	S.D.$_F$	t*	
1. Associations IV	7.13	3.64	6.46	3.38	2.53	.05
2. Object Naming	10.05	3.74	10.19	3.77	0.61	N.S.
3. Henmon-Nelson I.Q.	109.12	12.38	110.70	13.33	1.58	N.S.
4. Achievement	459.84	80.40	484.31	86.57	12.56	.001
5. SCAT-Verbal	41.51	9.91	42.63	9.65	1.53	N.S.
6. SCAT-Quantitative	35.85	7.26	34.66	7.66	2.20	.05
7. SCAT-Total	77.34	14.73	77.12	15.34	0.20	N.S.
8. Barrons Complexity	20.14	4.52	19.87	5.35	0.75	N.S.
9. I-I Inventory (revised)	57.50	11.27	53.96	11.15	4.25	.001

*Level of significance for a two-tailed test.

III. Sex and Other Variables

Sex differences were observed on several other variables considered in this study. Boys scored higher on the Associations IV test and on the Quantitative scale of the SCAT. In both cases the differences, although statistically significant, are so small as to be of little practical significance. Table X presents means for males and females on variables used in this study.

IV. Underachievement and Other Variables

The underachiever, when no control was made for I.Q. and sex scored significantly higher than average, or overachievers on both the Associations IV test and the Barrons Complexity Scale. Means for all relevant variables for under-, and overachievers are presented in Table XI. A tentative and somewhat presumptuous description of the typical grade 10 or 11 underachiever may on the basis of some of the findings of this study be made. The typical underachiever is:

(1) a male.

(2) verbally more flexible than the typical achiever.

(3) more complex and creative than the typical achiever.

(4) one who adheres to more irrational beliefs than the typical achiever.

TABLE XI

MEANS, STANDARD DEVIATIONS, AND t-VALUES FOR UNDER- AND OVERACHIEVERS ON EIGHT VARIABLES

Variable	Underachievers N=100		Overachievers N=115			Significance Level
	$\bar{X}$ under	S.D. under	$\bar{X}$ over	S.D. o	t	
1. Associations IV	7.80	3.81	5.83	3.69	3.82	.0005
2. Object Naming	10.22	3.84	9.96	3.88	0.50	N.S.
3. Henmon-Nelson I.Q.	118.65	12.81	100.49	10.93	11.12	.0005
4. Achievement	401.85	66.49	524.26	81.00	11.95	.0005
5. SCAT - Verbal	46.30	7.69	37.20	10.93	6.93	.0005
6. SCAT - Quantitative	36.27	6.74	34.74	7.24	1.59	N.S.
7. SCAT - Total	82.55	12.22	71.42	16.24	5.59	.0005
8. Barrons Complexity	21.81	5.00	19.09	6.32	3.45	.0005

V. Predicting Underachievement

Scores on the I-I Inventory (revised) can differentiate between an underachieving group and an achieving group of students. However, the use of the instrument as a tool to predict individual underachievement is questionable. Since the standard deviation is large (11.35) and the reliability coefficient only moderately high (.73) the standard error of measurement is large (6.25). Therefore, in predicting individual underachievement a large number of misclassifications will be made. Table XII is presented to illustrate the frequency of errors which will be made.

TABLE XII

EXPECTANCY TABLE

Discrepancy between aptitude and achievement		
-	False Positives p = .35	Hits p = .65
0	Hits p = .65	False Negative p = .35
+		

58
(critical score)

I-I Inventory Scores

It is highly probable that the number of "false positives" and "false negatives" would be decreased if the I-I Inventory (revised) was used in conjunction with one or more other psychometric instruments. An equation could be written which would use the I-I Inventory (revised) scores as one of the predictor variables along with the other predictor variables and each predictor would carry appropriate weights.

VI. Implications for Educational Practice

That underachievers possess irrational beliefs to a greater extent than do achievers is well supported in this study. It must be remembered that a correlation does not indicate a cause and effect relationship. However, it would be worthy of educators time and effort to attempt to change underachievers irrational beliefs in the hope of concomitantly changing the student's marks. Rather convincing research evidence supporting the fact that behavior can be changed by changing beliefs has been produced by Greenwald (1964, 1964a). Greenwald employed what might be called a lecture-discussion approach. Educators might well attempt both group therapy and/or individual therapy in an effort to bring about behavior change in this fashion. An orientation like that of Ellis (1962) which consciously and directly attacks the irrational beliefs of the counselee certainly merits exploration.

By administering the I-I Inventory early in the school year some of the underachieving students could be identified and

psychotherapy could be initiated immediately. Although, because of the shortcomings of the present version of the I-I Inventory, some "false negative" and some "false positive" errors will be made, there is an improved possibility that some students' behavior will be changed if treatment is initiated early in the term.

VII. Implications for Educational Research

Since the underachiever was found to be more complex, and flexible than the achiever further studies should be carried out to investigate these variables in connection with achievement. Various teaching methods could be experimented with in an attempt to discover if some methods are more effective with underachievers than others. The possibility that certain teacher traits are more therapeutic in working with underachievers than others should also be considered.

Further predictive validity studies should be carried out using the present version of the I-I Inventory. Because the Barrons Complexity Scale has demonstrated some ability in identifying underachievers further research with this instrument warrants consideration. Because the items are of a similar nature in these two tests it might be worthwhile to combine both as an underachievement scale.

Only a part of the variance associated with the behavior called "underachievement" has been isolated in this study. It is necessary to discover further non-intellective correlates of underachievement. The question of motivation, or the lack of it, has not been empirically

validated. Berlyne's (1960) arousal theory seems to have made investigation in this area possible. Home attitudes, child rearing practices, personality of parents, and socioeconomic status are only a few variables that might have a bearing on underachievement. A clinical approach with a few subjects is needed to investigate adequately the above variables.

Further research must be carried out in order that educators could more efficiently identify those students who are not working up to their capacities. This study points out the disparity in two methods of identifying underachieving students. Pippert and Archer (1963) show that results of research can be quite different depending on the method used to identify the experimental group in the first place.

VIII. Limitations of this Study

The conclusions and generalizations of this study are limited to large urban high schools in Alberta because the school in which the experiment was done is probably adequately representative of this type of school. Whether or not the same differences could be found in other types of school and locale is a matter for further experimentation.

It was assumed that socioeconomic status was not a relevant factor inasmuch as the sample was drawn from a school which represented all social classes. There is no empirical basis for this assumption.

Another limitation of this study is the fact that only one instrument was used to classify students according to ability. In further studies of this nature it is suggested that a mean of at least two ability measures be used and if possible that at least one of these measures be an individual I.Q. test. In a sense the ability measure was confirmed by another measure in this study because the SCAT correlated .77 with Henmon-Nelson I.Q. scores.

A basic assumption of this study was that achievement and ability are highly correlated. The actual correlation in this study was .56.

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A P P E N D I C E S

APPENDIX A

I-I INVENTORY

Name _____

Date _____ Grade _____

To The Student

This is a study of events and experiences in everyday life. You are asked to cooperate seriously and carefully in marking the items in this booklet. This is not an intelligence test. The best answer to each statement is your own first impression - there are no right or wrong answers.

Your answers will be treated with the strictest confidence and in no case will they be used to cause you any embarrassment.

INSTRUCTIONS FOR MARKING ANSWERS

For each statement, decide whether your answer is "Yes" or "No". If your answer is a definite "Yes" put an (X) on the end of the line where the "Yes" is typed. If your answer is a definite "No" put an (X) on the end of the line nearest the "No." If you are uncertain as to how you feel about the statement mark an (X) on the middle of the line. If the true answer is somewhere between the yes and no, put the (X) where it is most true for you.

Think carefully, but do not spend too much time on any one question. Let your <u>own</u> personal experience or opinion guide you to choose the answer <u>you feel</u> about each statement.

There is no time limit.

Please mark every item.

1. I would rather play by myself than with someone. Yes ? No

2. I prefer to get things done very quickly rather than being slow and sure in movement. Yes ? No

3. All human lives are equally sacred. Yes ? No

4. I usually object when a person steps in front of me in a line of people. Yes ? No

5. I have sometimes had a nickname which I didn't like very well. Yes ? No

6. I am afraid in the dark. Yes ? No

7. I prefer to accept suggestions rather than work them out for myself. Yes ? No

8. It is better to tell your troubles to your friends than to keep them to yourself. Yes ? No

9. Men are created equal in mental capacity. Yes ? No

10. It is necessary to be especially friendly to new students. Yes ? No

11. School promotions should be for intellectual merit alone. Yes ? No

12. I like to be praised. Yes ? No

13. It is foolish to let others see your emotions. Yes ? No

14. To spare the rod is to spoil the child. Yes ? No

15. I worry about little things. Yes ? No

16. There are people who try to do me harm or hurt me. Yes ? No

17. I sometimes worry about my health. Yes ? No

18. Students should not be required to take courses for which they see no use. Yes ? No

19. I like to bear responsibilities alone. Yes ? No

20. It is a big aid to health to say each morning, "Day by day in every way I am getting better and better." Yes ? No

21. Helping others is the very basis of life. Yes ? No

22. Firm convictions make for strength of character. Yes ? No

23. I feel that it is important to get on well with my teachers and principal. Yes ? No

24. Will power is the most important trait. Yes ? No

25. The "insanity plea" as a defence in murder trials is undesirable. Yes ? No

26. I must learn to "keep my head" when things go wrong. Yes ? No

27. I think that I am getting a square deal in life. Yes ? No

28. It is useless to worry about things that cannot be changed or corrected. Yes ? No

29. It is better to live a coward than die a hero. Yes ? No

30. I prefer to have someone with me when I receive bad news. Yes ? No

31. Some children are dull and unimaginative because of defective training in home and school. Yes ? No

32. Sympathy is the most divine passion of the human heart. Yes ? No

33. The good person is usually right. Yes ? No

34. Sometimes I feel that no one loves me. Yes ? No

35. I find it difficult to take criticism without feeling hurt. Yes ? No

36. We are justified in refusing to forgive our enemies. Yes ? No

37. It is all right to create a scene in order to get ones own way. Yes ? No

38. Riches are a sure basis for happiness in the home. Yes ? No

39. I worry over possible misfortunes. Yes ? No

40. I have sometimes crossed the street to avoid meeting some person. Yes ? No

41. I prefer to be alone. Yes ? No

42. The boy who regularly stands at the foot of his class is often a great success after leaving school. Yes ? No

43. I get disturbed when neighbours are very harsh with their little children. Yes ? No

44. I find it easy to set standards of "right" and "wrong." Yes ? No

45. Jeers humiliate me even when I know that I am right. Yes ? No

46. Admiration gratifies me more than achievement. Yes ? No

47. Punishment is a sure cure for crime. Yes ? No

48. I frequently feel self-conscious about my appearance. Yes ? No

49. My feelings are easily hurt. Yes ? No

50. Sometimes I am troubled by thoughts of death. Yes ? No

51. If I were able to do so I would attend some other school than the one I am now attending. Yes ? No

52. My folks are not reasonable to me when they demand obedience. Yes ? No

53. Habits of pre-school years carried over into adult life may help determine our usefulness. Yes ? No

54. I get annoyed when people are impolite to me. Yes ? No

55. If one needs something badly enough and cannot buy it, there are times when it is all right to take it. Yes ? No

56. I want people to like me better. Yes ? No

57. Too much importance is attached to the possession of money and good clothes in this school. Yes ? No

58. Criminals are really sick and should be treated like sick persons. Yes ? No

59. I get terribly upset and miserable when things are not the way I would like them to be. Yes ? No

60. This school provides adequate opportunity for me to meet and make friends. Yes ? No

61. I worry about eternity. Yes ? No

62. I need to learn how to keep from being too aggressive. Yes ? No

63. I would like school better if teachers were not so strict. Yes ? No

64. Children outgrow their bad habits. Yes ? No

65. I get upset when I hear of people (not relatives or close friends) who are very ill. Yes ? No

66. It is all right to cheat in a game when you will not get caught. Yes ? No

67. My folks do not take time to become acquainted with my problems. Yes ? No

68. This school places too much emphasis upon grades. Yes ? No

69. The members of my family seem to criticize me a lot. Yes ? No

70. I get very angry when I miss a bus which passes only a few feet away from me. Yes ? No

71. I find that this school tends to make me unhappy. Yes ? No

72. I can walk past a grave yard alone at night without feeling uneasy. Yes ? No

73. I usually like to be somewhere else than at home. Yes ? No

74. I enjoy being alone more than being with my classmates. Yes ? No

75. A person who will not stand up for his rights as a teen-ager will probably not be able to stand up for his rights as an adult. Yes ? No

76. Other people's problems frequently cause me great concern. Yes ? No

77. Crime never pays. Yes ? No

78. I wish that more affection were shown by more members of my family. Yes ? No

79. I worry about tests. Yes ? No

80. When I see movies about daring robberies, I usually hope the robber won't get caught in the end. Yes ? No

81. When things are not the way I would like them to be, and it is not in my power to change them, I calmly accept things the way they are. Yes ? No

82. I feel that life has a great deal more happiness than trouble. Yes ? No

83. I can face a difficult task without worry. Yes ? No

84. I avoid inviting others to my home because it is not as nice as theirs.

85. I prefer to be independent of others in making decisions.

86. A juvenile delinquent will almost surely be a criminal when he becomes an adult.

87. He that loses his conscience has nothing left that is worth keeping.

88. It is better to have friends than fame.

89. My folks appear to doubt whether I will be successful.

90. I feel guilty when I misbehave and I expect to be punished.

91. Sticks and stones will break my bones, but words will never hurt me.

92. I tend to worry over possible troubles.

93. Many of my classmates are so unkind or unfriendly that I avoid them.

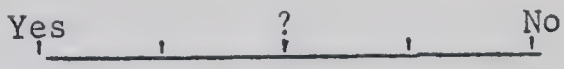
94. I tend to look to others for the kind of behavior they approve as right and wrong.

95. If a child is brought up in a home where there is much quarreling and unhappiness he will probably be unhappy in his own marriage.

96. People who unjustly criticize the government should be put in jail.

97. When a friend ignores me I become extremely upset.

98. If a person tries hard enough, he can be first in anything.



99. The police may sometimes be right in giving a man the "third degree" to make him talk. Yes ? No

100. It hurts me when my friends are unkind. Yes ? No

101. I worry about the possibility of an atomic attack by some foreign power. Yes ? No

102. I often spend more time in trying to think of ways of getting out of something than it would take me to do it. Yes ? No

103. I feel my parents have dominated me too much. Yes ? Np

104. I know there is a God. Yes ? No

105. I find it very upsetting when people who are important to me are indifferent to me. Yes ? No

106. When a person is no longer interested in doing his best he is done for. Yes ? No

107. The best way to teach a child right from wrong is to spank him when he is wrong. Yes ? No

108. It is impossible at any given time to change one's emotions. Yes ? No

109. I frequently do things that I am afraid of doing in order to prove to myself that there is nothing intrinsically frightful about these things. Yes ? No

110. I am happiest when I am sitting around doing little or nothing. Yes ? No

111. Cooperation is better than competition. Yes ? No

112. It is sinful to doubt the Bible. Yes ? No

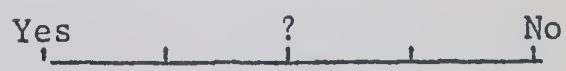
113. It makes me uncomfortable to be different. Yes ? No

114. People who do not achieve competency in at least one area are worthless.

115. People who perform acts which are immoral do so because they are too stupid or too ignorant to refrain from doing so.

116. Unhappiness largely comes from within and is largely created by the unhappy person himself.

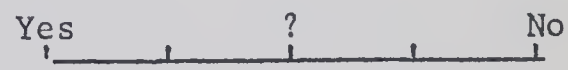
117. I am naturally a lazy person.



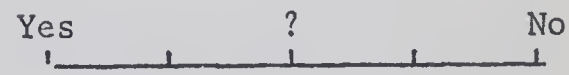
118. It is better to take risks and to commit possible errors, than to seek unnecessary aid of others.

119. Persons who are punished for this "sins" usually change for the better.

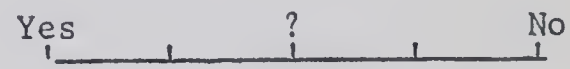
120. It would be terrible or catastrophic to be a cripple.



121. I follow a definite study schedule during the school term.



122. Most people can be truly outstanding in at least one area of their work.



APPENDIX B

RETAINED ITEMS FROM ORIGINAL I-I INVENTORY

Item		Response in Direction of Underachievement	χ^2
3.	All human lives are equally sacred.	(No)	4.30*
11.	School promotions should be for intellectual merit alone.	(Yes)	3.48*
12.	There are people who try to do me harm or hurt me.	(Yes)	5.45*
18.	Students should not be required to take courses for which they see no use.	(Yes)	5.26*
24.	Will power is the most important trait.	(No)	4.42*
26.	I must learn to keep my head when things go wrong.	(No)	5.10*
28.	It is useless to worry about things that cannot be changed or corrected.	(No)	4.97*
36.	We are justified in refusing to forgive our enemies.	(Yes)	7.24**
37.	It is all right to create a scene in order to get one's own way.	(Yes)	3.22*
38.	Riches are a sure basis for happines in the home.	(Yes)	8.84**
51.	If I were able to do so I would attend some other school than the one I am now attending.	(Yes)	3.94*
60.	This school provides adequate opportunity for me to meet and make new friends.	(No)	5.12*
63.	I would like school better if teachers were not so strict.	(Yes)	9.30***

RETAINED ITEMS FROM ORIGINAL I-I INVENTORY (continued)

Item	Response in Direction of Underachievement	χ^2
71. I find that this school tends to make me unhappy.	(Yes)	11.37***
73. I usually like to be somewhere else than at home.	(Yes)	7.25**
80. When I see movies about daring robberies, I usually hope the robber won't get caught in the end.	(Yes)	8.48**
81. When things are not the way I would like them to be and it is not in my power to change them, I calmly accept things the way they are.	(No)	12.26***
82. I feel that life has a great deal more happiness than trouble.	(No)	4.35*
89. My folks appear to doubt whether I will be successful.	(Yes)	7.11*
93. Many of my classmates are so unkind or unfriendly that I avoid them.	(Yes)	4.03*
110. I am happiest when I am sitting around doing little or nothing.	(Yes)	4.07*
111. Cooperation is better than competition.	(No)	11.61***
114. People who do not achieve competency in at least one area are worthless.	(Yes)	3.66*
117. I am naturally a lazy person.	(Yes)	4.16*
121. I follow a definite study schedule during the school term.	(No)	3.23*

*$p < .20$
**$p < .05$
***$p < .01$

APPENDIX C

BARRONS COMPLEXITY SCALE (1963) Revised

Please answer ALL questions on the separate answer sheet as being either true or false for you.

Please do not write in this Test Booklet.

- - - - - -

1. I believe in a life hereafter.
2. I get mad easily and then get over it soon.
3. I believe there is a God.
4. In religious matters, I believe I would have to be called an agnostic.
5. I frequently undertake more than I can accomplish.
6. The unfinished and the imperfect often have greater appeal for me than the completed and the polished.
7. I could cut my moorings-quit my home, my parents, and my friends-without suffering great regrets.
8. Politically I am probably something of a radical.
9. I think I take primarily an esthetic view of experience.
10. I remember that my first day at school was very painful.
11. I would enjoy the experience of living and working in a foreign country.
12. I don't expect to have more than two children.
13. Many of my friends would probably be considered unconventional by other people.
14. The way things look now I guess I won't amount to much in the world.
15. I enjoy discarding the old and accepting the new.
16. I doubt that anyone will ever be able to predict my every move.
17. Some of my friends think that my ideas are impractical, if not a bit wild.
18. When someone talks against certain groups or nationalities, I always speak up against such talk, even though it makes me unpopular.
19. I enjoy the company of strong-willed people.
20. As a child my home life was not as happy as that of most others.
21. I have always had goals and ambitions that were beyond anything practical or that seemed capable of being realized.
22. I often get the feeling that I am not really part of the group I associate with and that I could separate from it with little discomfort or hardship.

23. People would be happier if sex experience were taken for granted in both men and women.

24. I guess my friends tend to think of me as a cold and unsentimental sort of person.

25. I don't like modern art.

26. Disobedience to the government is never justified.

27. Perfect balance is the essence of all good composition.

28. It would be better if our teachers would give us a clearer idea of what they consider important.

29. Straightforward reasoning appeals to me more than metaphors and the search for analogies.

30. It is a pretty callous person who does not feel love and gratitude toward his parents.

31. Things seem simpler as you learn more about them.

32. Every wage earner should be required to save a certain part of his income each month so that he will be able to support himself and his family in later years.

33. Kindness and generosity are the most important qualities for a wife to have.

34. When a person has a problem or worry, it is best for him not to think about it, but to keep busy with more cheerful things.

35. It is the duty of a citizen to support his country, right or wrong.

36. Barring emergencies, I have a pretty good idea what I'll be doing for the next 10 years.

37. Army life is a good influence on most young men.

38. I prefer team games to games in which one individual competes against another.

39. An invention which takes jobs away from people should be suppressed until new work can be found for them.

40. A person who doesn't vote is not a good citizen.

41. I become quite irritated when I see someone spit on the sidewalk.

42. I often wish people would be more definite about things.

43. It is always a good thing to be frank.

44. When I get bored I like to stir up some excitement.

45. Sometimes I have the same dream over and over.

46. I much prefer symmetry to asymmetry.

47. I would rather be a steady and dependable worker than a brilliant but unstable one.

48. I would be willing to give money myself in order to right a wrong, even though I was not mixed up in it in the first place.

49. It is annoying to listen to a lecturer who cannot seem to make up his mind as to what he really believes.

50. There are times when I act like a coward.

APPENDIX D

BARRON COMPLEXITY SCALE: RESPONSE IN DIRECTION OF COMPLEXITY

Item	Response	Item	Response	Item	Response
1.	False	22.	True	43.	False
2.	True	23.	True	44.	True
3.	False	24.	True	45.	False
4.	True	25.	False	46.	False
5.	True	26.	False	47.	False
6.	True	27.	False	48.	True
7.	True	28.	False	49.	False
8.	True	29.	False	50.	True
9.	True	30.	False		
10.	True	31.	False		
11.	True	32.	False		
12.	True	33.	False		
13.	True	34.	False		
14.	True	35.	False		
15.	True	36.	False		
16.	True	37.	False		
17.	True	38.	False		
18.	True	39.	False		
19.	True	40.	False		
20.	True	41.	False		
21.	True	42.	False		

APPENDIX E

CHECK TO SEE THAT THIS BOOKLET HAS 6 PAGES. RAISE YOUR HAND IF IT DOES NOT

Please Fill in the Following Information

Name: _____ I.D. Number | | | | | | |
Last First

AGE: _____yrs. Sex M F (circle one)

Name of Home Town or City _____

How many years at University (circle one) 1, 2, 3, 4, 5, or more yrs.

- - - - - - - - - - - - - - - -

STOP DO NOT PROCEED UNTIL TOLD TO DO SO

- - - - - - - - - - - - - - - -

Instructions

ASSOCIATIONS IV--Fa-3

The items in this test consist of pairs of words. Your task is to think of a word that is associated with both given words. The associated word must have a different meaning in its relation- to each of the given words.

Look at the following example:

Jewelry ring bell

The associated word "ring" has been written in the blank space between the given words. It has a different meaning in connection with each of the words. It is a piece of jewelry but it also is the sound of a bell.

Try the next example:

Newstand _____ cannon

The associate word is "magazine" since it can be displayed at a newsstand or it can be a storehouse for ammunition.

The remaining items should be worked in the same manner. Work rapidly but be sure that your answer has TWO meanings.

This test consists of two parts, each containing 15 items. You will have 7 minutes working time for each part. Are there any questions?

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

Part I (7 minutes)

1.	emerald	_____	rookie
2.	theater	_____	fishing
3.	card	_____	ship
4.	clothes	_____	law
5.	railroad	_____	electricity
6.	music	_____	tent
7.	eye	_____	pig
8.	postman	_____	knight
9.	stove	_____	card game
10.	shepherd	_____	steal
11.	hibernation	_____	porter
12.	river	_____	money
13.	duel	_____	time
14.	cigarette	_____	tree
15.	cheese	_____	pencil

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

STOP

DO NOT TIP

Part II (7 minutes)

16.	kitchen	_____	boat
17.	ink	_____	animal
18.	baseball	_____	airplane
19.	bird	_____	dollar
20.	radio	_____	toothpaste
21.	music	_____	fish
22.	girl	_____	by-pass
23.	hammer	_____	finger
24.	store	_____	cavalry
25.	wind	_____	recruits
26.	football	_____	examination
27	fence	_____	union
28.	winter	_____	pepper
29.	candy	_____	money
30.	sum	_____	nobility

DO NOT GO BACK TO PART I AND

DO NOT GO ON TO ANY OTHER TEST UNTIL ASKED TO DO SO

STOP

APPENDIX F

DO NOT PROCEED UNTIL TOLD TO DO SO

OBJECT NAMING--Xs-3

In this test you will be given the name of a class of objects. Your task is to write down, in the time allowed, the names of as many objects in the class as you can.

EXAMPLE: You are given a class defined as MINERAL.

You might write down: iron

uranium

granite

copper

Write as quickly as you can, but be sure that the names you write belong in the class of objects or things given. Make your letters as legible as possible.

There are two parts to this test. You will have 2 minutes for each part.

Are there any questions?

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

DO NOT REMOVE SLIP. FOLD TO [illegible]

[illegible]

[illegible] objects.
[illegible], [illegible] allowed, the names of as many

[illegible] MEMBER.

[illegible]:

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] but be sure to put the names you write
[illegible] ballot given. Make your letters as

DO NOT FOLD [illegible] FOLD TO

PART I (2 minutes)

FLUIDS (all matter that is not living or solid)

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

PART II (2 minutes)

PLANTS (all living things that are not animals)

DO NOT GO BACK TO PART I AND

DO NOT GO ON TO ANY OTHER TEST UNTIL ASKED TO DO SO.

STOP

APPENDIX G

RAW SCORES AND CORRESPONDING T SCORES FOR ABILITY AND ACHIEVEMENT IN GRADE 10

Academic Ability Henmon-Nelson IQ	T Score	Academic Achievement Aggregate Score in 8 Subjects	T Score
155	80	725	80
154	77	705	75
152	75	695	74
151	73	690	74
147	72	670	73
142-143	71	665	72
140	70	655-660	70
138	69	640-650	69
134-136	68	630-635	68
132-133	67	620	67
131	66	610-615	66
129-130	65	600-605	65
128	64	590-595	64
127	63	580-585	63
126	62	575	62
123-125	61	565-570	61
120-122	60	555-560	60
118-119	59	540-550	59
117	58	535	58
116	57	525-530	57
115	56	510-520	56
114	55	500-505	55
113	54	490-495	54
112	53	480-485	53
111	52	470-475	52
110	51	460-465	51
109	50	450-455	50
108	49	440-445	49
106-107	48	430-435	48
105	47	425	47

RAW SCORES AND CORRESPONDING T SCORES FOR ABILITY AND ACHIEVEMENT IN GRADE 10 (continued)

Academic Ability Henmon-Nelson IQ	T Score	Academic Achievement Aggregate Score in 8 Subjects	T Score
104	46	420	46
103	45	415	45
101-102	44	410	44
100	43	405	43
99	42	395-400	42
98	41	390	41
97	40	385	40
96	39	380	39
95	38	370-375	38
93-94	36	365	37
91-92	35	360	36
90	34	355	36
89	33	350	35
88	32	345	33
87	31	340	32
86	30	335	31
84	29	330	30
83	28	325	29
82	24	315	27
		310	26
		305	25
		290	23
		280	20

RAW SCORES AND CORRESPONDING T SCORES FOR ABILITY AND ACHIEVEMENT IN GRADE 11

Academic Ability		Academic Achievement	
Henmon-Nelson IQ	T Score	Aggregate Score in 8 Subjects	T Score
154	80	720	80
151	75	695	76
145	73	690	74
144	72	675	73
140	71	670	71
139	70	665	70
138	68	660	69
136-137	67	650	68
134-135	66	635-640	67
132-133	65	620-630	66
130-131	64	600-615	65
127-129	63	595	64
124-126	62	585-590	63
123	61	580	62
120-122	60	570-575	61
118-119	59	565	60
116-117	57	555-560	59
115	55	545-550	58
114	54	530-540	57
113	53	520-525	56
112	51	510-515	55
110-111	50	505	54
109	49	495-500	53
108	48	485-490	52
107	47	480	51
105-106	46	465-475	50
104	45	460	49
103	44	455	48
102	43	445-450	47
100-101	42	440	46

RAW SCORES AND CORRESPONDING T SCORES FOR ABILITY AND ACHIEVEMENT IN GRADE 11 (continued)

Academic Ability Henmon-Nelson IQ	T Score	Academic Achievement Aggregate Score in 8 Subjects	T Score
99	41	435	45
98	40	430	44
96-97	39	420-425	43
95	38	410-415	42
94	37	400-405	41
93	36	395	40
91-92	34	390	39
90	33	380-385	38
89	32	370-375	37
87-88	31	360-365	36
86	29	355	35
85	28	345-350	34
82	26	340	33
81	24	330-335	32
80	20	320-325	31
		305-310	30
		280-300	29
		265	28
		255	27
		245	24

APPENDIX H

RAW SCORES AND CORRESPONDING T SCORES FOR
ABILITY IN GROUPS I, II, III, AND IV

T Score	Academic Ability (Henmon-Nelson I.Q.) Group I	Group II	Group III	Group IV
79		155		
78	154			134
77			138	
76			137	
75		154	134-136	131-133
74	152	153	131-133	128-130
73		152	129-130	125-127
72		148-151		124
71	150-151	145-147	128	123
70	147-149	142-144		122
69	145-146	139-141		119-121
68	144	136-138	127	116-118
67	142-143	133-135	124-126	
66	139-141	132	121-123	115
65		131	119-120	114
64	138	129-130	117-118	113
63	135-137	127-128	116	
62	133-134	125-126	115	112
61	131-132	123-124	114	111
60	130	122		
59	127-129	121	113	110
58	126	119-120	112	
57	125	118	111	109
56	124	117		108
55	121-123	116	110	107
54	120	115	109	106
53	119		108	105
52	118	114	107	104
51	117	113	106	103
50	116	112	105	102
49	115		104	100-101
48		111	103	99
47	114	110	102	98
46		109	101	97
45	113	108	100	96

RAW SCORES AND CORRESPONDING T SCORES FOR
ABILITY IN GROUPS I, II, III, AND IV
(continued)

T Score	Academic Ability (Henmon-Nelson I.Q.) Group I	Group II	Group III	Group IV
44	112	106-107		
43	111	105	99	95
42	110		98	94
41	109	104	97	93
40	108	103	96	92
39	107	101-102	95	91
38	105-106	100	94	
37	104	99	93	90
36	103	98	92	89
35		97	91	88
34	102	96	89-90	87
33	99-101	95	87-88	86
32	96-98	94		84-85
31	95	92-93	86	
30	94	89-91	84-85	
29	93	86-88	83	
28	92	84-85		
27	91	83	82	82
26		82		
25				
24		81		
23			81	
22	87	80		

RAW SCORES AND CORRESPONDING T SCORES FOR ACHIEVEMENT IN GROUPS I, II, III, AND IV

T Score	Academic Achievement (score for 8 subjects) Group I	Group II	Group III	Group IV
78	715-720	725		
77	705-710	715-720	690	
76	700	710	685	575
75	695	705	675-680	
74	690	695-700	665-670	
73	685	685-690	635-660	570
72	680	675-680	605-630	560-565
71		670	580-600	545-555
70	675	665	575	535-540
69	670	655-660	570	525-530
68	665	645-650	565	515-520
67	660	635-640	560	510
66	655	625-630	555	505
65	650	615-620	550	495-500
64	640-645	605-610	545	490
63	625-635	595-600	540	485
62	615-620	585-590	530-535	480
61	605-610	575-589	520-525	475
60	595-600	565-570	510-515	470
59	590	555-560	505	465
58	585	550		460
57	580	545	500	455
56	570-575	535-540	495	445-450
55	565	525-530	485-490	440
54	560	515-520	475-480	435
53	555	500-510	465-470	430
52	540-545	495	455-460	425
51	530-535	485-490	450	420
50	525	480	445	410-415
49	520	470-475	440	405
48	510-515	460-465	435	400
47	500-505	455	430	395
46	490-495	450		390
45	485	440-445	425	385

RAW SCORES AND CORRESPONDING T SCORES FOR ACHIEVEMENT IN GROUPS I, II, III, AND IV (continued)

T Score	Academic Achievement (score for 8 subjects) Group I	Group II	Group III	Group IV
44	480	430	420	380
43	465-475	425	415	375
42	455-460	420	410	365-370
41	445-450	410-415	405	360
40	430-440	400-405	395-400	
39	415-425	395	390	355
38	405-410	390	385	350
37	400	385	380	345
36	395	380	370-375	
35	390	375	365	340
34	380-385	365-370	360	335
33	360-375	360	350-355	330
32	345-355	355	340-345	325
31	330-340	350	335	320
30	320-325	330-345		315
29	305-315	310-325	330	310
28	295-300	290-305	325	305
27	280-290	275-285	320	300
26	270-275	265-270	310-315	295
25	265	255-260	300-305	290
24	260	245-250	290-295	
23	255		280-285	
22	245-250			255

APPENDIX I

ELEVEN IRRATIONAL IDEAS*

1. The idea that it is a dire necessity for an adult human being to be loved or approved by virtually every significant other person in his community.
2. The idea that one should be thoroughly competent, adequate and achieving in all respects if one is to consider oneself worthwhile.
3. The idea that certain people are bad, wicket, or villainous and that they should be severly blamed or punished for their villainy.
4. The idea that it is awful and catastrophic when things are not the way one would very much like them to be.
5. The idea that human unhappiness is externally caused and that people have little or no ability to control their sorrows and disturbances.
6. The idea that if something is or may be dangerous or fearsome one should be terribly concerned about it and should keep dwelling on the possibility of its occurring.
7. The idea that it is easier to avoid than to face certain life difficulties and self-responsibilities.
8. The idea that one should be dependent on others and needs someone stronger than oneself on whom to rely.

*See Ellis (1962), page 60ff for a fuller statement of each idea.

ELEVEN IRRATIONAL IDEAS (continued)

9. The idea that one's past history is an all-important determiner of one's present behavior and that because something once strongly affect one's life, it should indefinitely have a similar effect.
10. The idea that one should become quite upset over other people's problems and disturbances.
11. The idea that there is an invariably, right, precise, and perfect solution to human problems and that it is catastrophic if this perfect solution is not found.

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